

## THE ORB-WEAVER GENERA *ARANIELLA* AND *NUCTENEA* (Araneae: Araneidae)

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**ABSTRACT.** The species included in *Araniella* and *Nuctenea* have traditionally been included in *Araneus*, but males differ in lacking the embolus cap. The lack of embolus cap can be related to differences in mating behavior. Those orb-weavers with cap (*Araneus*) can mate only once with each palpus; *Nuctenea* males lacking a cap can mate several times.

Four species of *Araniella* are known, one of them Holarctic, the others Palearctic. Some European populations are of interest as there are indications that the species hybridize.

Of the six species known to belong to *Nuctenea*, three are Holarctic, and three Palearctic. One of the Holarctic species may be a recent introduction to North America; another may be cosmopolitan.

Other species belonging to these two genera may be hidden among the two thousand species placed in *Araneus* and mostly poorly described.

### INTRODUCTION

*Araniella* and *Nuctenea* species have traditionally been placed in *Araneus*. They include our commonest orb-weavers. Nevertheless the species are not well known, and in looking through the collections available, I found that many specimens were misidentified.

The species of both genera are mainly Palearctic with some Holarctic species.

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One of the striking and puzzling features of these common orb-weavers is the enormous individual variation in genitalic structure (Figs. 8-15, 17, 18, 67-76), while there is little variation in the size and shape of the whole animal. This variation is found in Holarctic *Araniella displicata* and *A. cucurbitina* of Europe as well as in Holarctic *Nuctenea patagiata* and Holarctic *N. cornuta*. Not infrequently specimens of these common species are sent to the museum by collectors who believe them to

be a new species. In their unusual variation, *Araniella* and *Nuctenea* contrast with the small *Araneus* species (Levi, 1973). Even though the species are fairly widespread, the differences between small *Araneus* species are far less than is found among individuals of a single collection of *N. cornuta*. The larger-sized *Araneus* species (*A. nordmanni*, *A. saevus*) are intermediate in this respect (Levi, 1971). Large variation was not found in any of the widespread, common theridiids such as *Achaearanea tepidariorum*, although it does occur in the *Tidarren* species and *Enoplognatha ovata*. Variation in the genitalic structure of individuals was found in the zone of overlap between *Araneus gemma* and *Araneus gemmoides*; all evidence indicates hybridization (Levi, 1971). *Araniella* species may also hybridize in Europe. Perhaps the individual variation of *Araniella cucurbitina* of Europe is due to separation of northern and southern populations during the Pleistocene and the later hybridization occurred after the receding of the ice. In none of the species of *Araniella* or *Nuctenea* is the variation geographic. But I have not studied various populations in detail. Shortly after Petrunkevitch (1925) wrote on the remarkable variation of genitalia of *Agelena naevia*, Seyler (1940), following up a hint from Gertsch (1934), correctly found that what Petrunkevitch called one species was in fact several. But I doubt that populations of *Araniella displicata* or *Nuctenea patagiata* and *N. cornuta* consist of sibling species.

Of considerable interest is the relationship of *Araniella* species in Europe. Mr. Locket made me aware of this. While *A. inconspicua* and *A. alpica* appear distinct on the Continent, intermediates are found in Great Britain.

While in many American araneid and theridiid species specimens from the Gulf Coast and Florida are noticeably smaller than those from other parts of North America, Alaskan specimens of *N. cornuta* are smaller than those from southern Canada

and the United States. To judge by the labels, *N. cornuta* is less dependent on houses in Alaska and probably competes with the native *Araneus* species. In north-eastern America all three *Nuctenea* species are usually found on buildings, but this is not true throughout their ranges. *Nuctenea patagiata* may be found under bark in woods.

It is most unfortunate that at times names have to be changed as a result of revisionary studies.

### *Araniella* Chamberlin and Ivie

*Araniella* Chamberlin and Ivie, 1942, Bull. Univ. Utah, biol. ser., 7(1): 76. Type species *Epeira displicata* Hentz, by original designation. The name is of feminine gender.

*Note.* Chamberlin and Ivie (1942) do not give reasons for separating *E. displicatus* from *Araneus* other than that the species is close to those of *Neoscona*. I agree with this opinion.

*Diagnosis.* There are no good superficial characters that separate female *Araniella* from the small species of *Araneus*. Females have a glabrous carapace and an oval abdomen, widest in the middle, lacking setae and lacking a folium pattern, but usually with paired black spots (Plate 1, Figs. 1, 16). The epigynum has a short, wide, wrinkled scape (Figs. 8, 25, 34, 40). The scape is not always clearly set off from the base of the epigynum. Unlike *Araneus* species, however, *Araniella* has, besides a single pair of seminal receptacles, a pair of sclerotized sacs (Figs. 7, 27, 33, 39) between the external entrance from outside to the connecting duct and the seminal receptacles. The entrance of the duct to the sclerotized sacs on each side is a slit. The ducts are hard to see in very sclerotized epigyna (*A. cucurbitina*).

Unlike other araneids I have examined, *Araniella* has three macrosetae (Figs. 31, 42) on the patella of the male palpus. Species of most genera have only two or one. However, the palpal femur has a basal ventral tooth facing a tooth on the

endite as in *Araneus*. The palpus resembles that of *Neoscona* (Berman and Levi, 1971, fig. 31) in having the sclerites nearly fused, a small flap-like terminal apophysis (A in Figs. 20–22), and in lacking a distal hematodocha (Fig. 21). This contrasts with the huge terminal apophysis and distal hematodocha in *Araneus* and *Nuctenea* (Figs. 58, 61). *Araniella* species also differ from *Neoscona* and *Araneus* in the hook-shaped, sclerotized, median apophysis (M), dorsally directed toward the cymbium (Figs. 20, 22), and in the unusually complex, large conductor (C). The embolus (E) lacks a cap. An embolus cap is always present in virgin males of *Araneus* species; the cap breaks off in mating.

*Araniella* males have a hook on the distal margin of the first coxa, and the second femur has a matching depression. The legs of males are longer than those of females, and bear many macrosetae.

Most *Araniella* are green or yellow to reddish in color when alive, similar to small species of *Araneus*. The color, except the black spots, washes out in alcohol. All species are about the same size and proportions (Figs. 1, 16).

*Natural history.* All species build a small web between leaves; the web may be horizontal. The spiders are active at daytime. The egg sac has a loose woollen appearance (Plate 1).<sup>1</sup>

*Distribution.* The known species are all Palearctic, except *A. displicata* which is Holarctic in distribution.

*Misplaced species.* *Araniella geayi* Ca-

<sup>1</sup> I had anticipated that *Araniella* males, which resemble males of *Nuctenea* species in lacking a cap on the embolus, would likewise be able to mate repeatedly. Therefore, it was with considerable interest that, after submitting my own manuscript, I received R. Blanke (1973, *Neue Ergebnisse zum Sexualverhalten von Araneus cucurbitinus*, *Forma et Functio*, 6: 279–290). Blanke did indeed observe differences between the behavior of *A. cucurbitinus* and that of *Araneus* species: The female approaches the male, the male taps the tarsi of females, and the male mates several times.

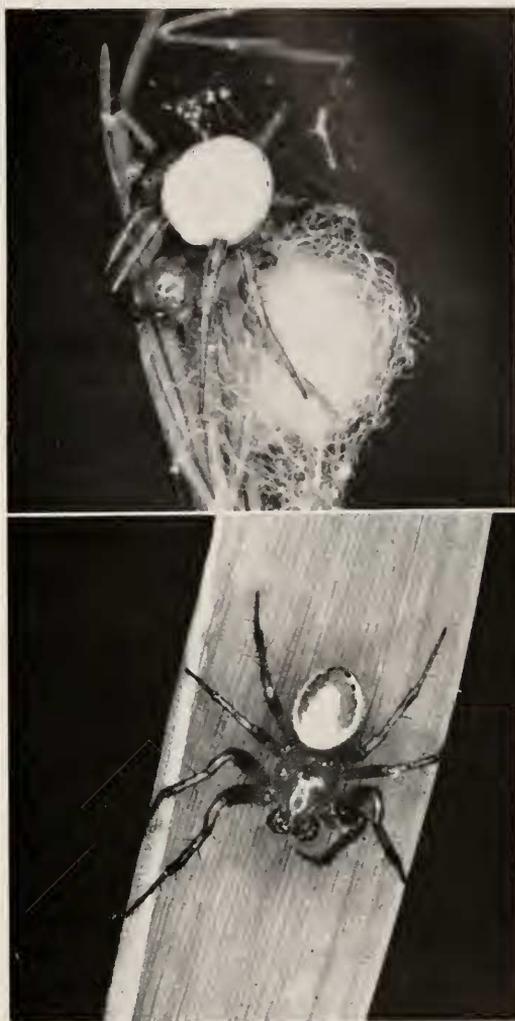
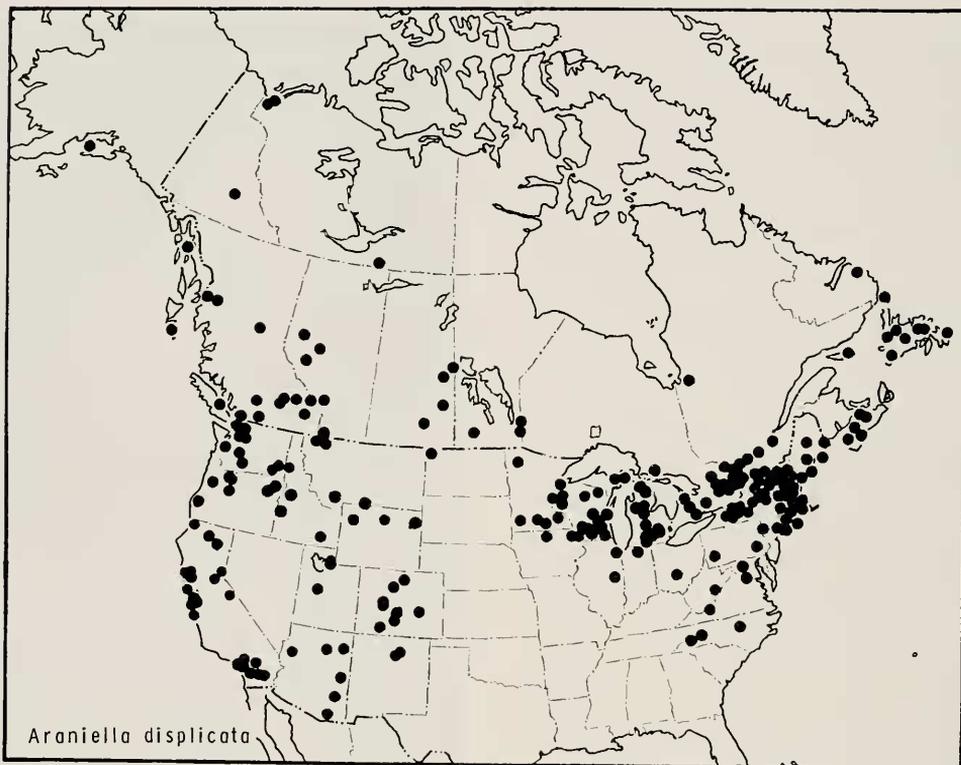


Plate 1. *Araniella displicata* (Hentz). Above, female with egg sac. Below, male. Both laboratory photographs, from Massachusetts.

poriaco, 1954, *Comm. Pontifica Acad. Sci.*, 16: 104 from Guyana has as a holotype a juvenile specimen belonging to the genus *Araneus* deposited in the Zoological Museum of the University of Florence, examined.

#### KEY TO SPECIES OF *ARANIELLA*

- 1 Male, conductor of palpus with a distal lobe directed at and close to palpal patella (Figs. 37, 42); female with epigy-



Map 1. North American distribution of *Araniella displicata* (Hentz).

- num scape having proximal part widest, much wider than tip (Figs. 34, 40) ----- 2
- Male palpal conductor without distal lobe toward patella (Figs. 18, 30); female epigynum with scape having parallel sides or proximal constriction (Figs. 10, 25) ----- 3
- 2(1) Median apophysis with fin toward the embolus (Fig. 42); female with base of epigynum showing on each side of scape (Fig. 40); Europe ----- *alpica*
- Median apophysis without fin (Fig. 37); female epigynum base not showing in ventral view (Fig. 34); Eurasia ----- *inconspicua*
- 3(1) Conductor with a set-off piece which holds terminal apophysis and embolus (Figs. 22, 30, 31); scape of epigynum narrower or of equal width to part of base visible on each side of it (Figs. 23, 25); Eurasia, perhaps Arctic North America ----- *cucurbitina*
- Conductor without set-off piece holding terminal apophysis and embolus (Figs. 17, 18); scape of epigynum much wider

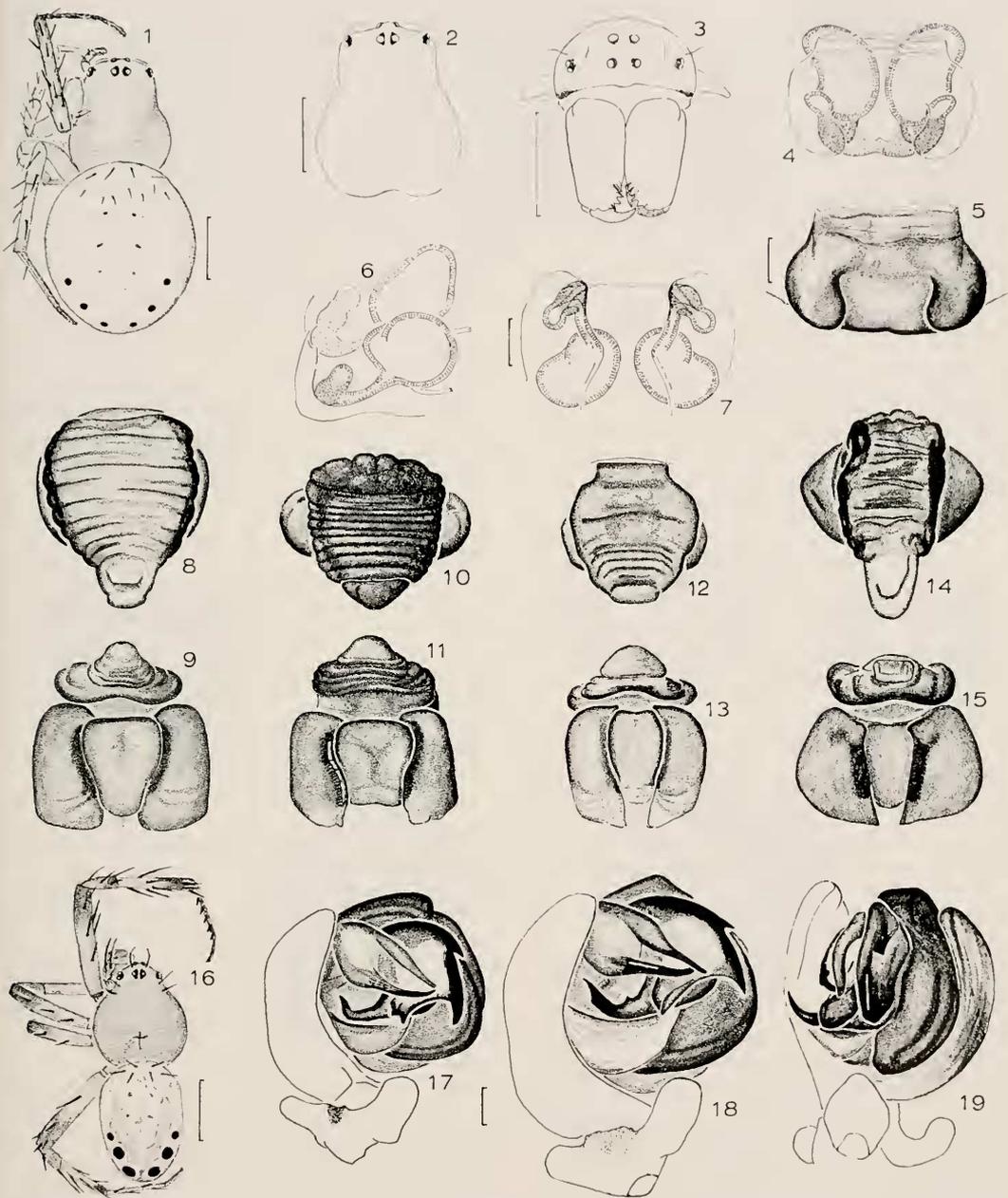
than part of base showing on each side of it (Figs. 8-14); North America and Eurasia ----- *displicata*

***Araniella displicata* (Hentz)**  
**Plate 1; Figures 1-21; Map 1**

*Epeira displicata* Hentz, 1847, J. Boston Soc. Natur. Hist., 5: 476, pl. 31, fig. 17. Types from Alabama, May, Oct., destroyed. Emerton, 1884, Trans. Connecticut Acad. Sci., 6: 313, pl. 34, fig. 4, pl. 36, fig. 20, 342. Keyserling, 1893, Spinnen Amerikas, 4: 219, pl. 10, fig. 162, ♀. Emerton, 1902, Common Spiders, p. 172, fig. 405. Kaston, 1948, Bull. Connecticut Geol. Natur. Hist. Surv., 70: 258, fig. 806, ♀.

*Epeira decipiens* Fitch, 1856, Trans. New York Agric. Soc., 15: 451. Male specimen from New York, lost.

*Epeira sexpunctata* Keyserling, 1884, Verhandl. Zool. Bot. Gesell. Wien, 34: 530, pl. 13, fig. 28, ♀. Female type from North America in the Museum of Comparative Zoology, examined. Keyserling, 1892, Spinnen Amerikas, 4: 200, pl. 9, fig. 148.



Figures 1-19. *Araniella displicata* (Hentz). 1-15. Female. 1. Dorsal view. 2. Carapace. 3. Eyes and chelicerae. 4. Internal genitalia with epigynum cleared. 5. Epigynum having scape torn off. 6-7. Internal genitalia. 6. Anterolateral. 7. Posterior. 8-15. Epigynum. 8, 10, 12, 14. Ventral view. 9, 11, 13, 15. Posterior view. 8, 9, 10, 11, 14, 15. (California.) 12, 13. (Oregon.) 16-19. Male. 16. Dorsal view. 17, 18. Left male palpus, mesal view. 19. Palpus, ventral view. 17. (Minnesota.) 18, 19. (Montana.)

Scale lines. 0.1 mm; Figs. 1-3, 16, 1 mm.

- Epeira alba* Keyserling, 1884, Verhandl. Zool. Bot. Gesell. Wien, 34: 530, pl. 13, fig. 20, ♀. Female type from Kentucky in the Museum of Comparative Zoology, examined.
- Epeira cucurbitina*, - McCook, 1893, American Spiders, 3: 150, pl. 3, figs. 1-3, pl. 4, fig. 6, ♀, ♂. Not *A. cucurbitina* (Clerck).
- Aranens croaticus* Kulczyński, 1905, Bull. Acad. Sci. Cracovie, 233, pl. 7, figs. 22, 30, ♀. Female holotype from Croatia in the Polish Academy of Sciences, Warsaw, examined. NEW SYNONYMY.
- Aranea displicata*, - Comstock, 1912, Spider Book, p. 494, figs. 524, 525, ♀, web. Wiehle, 1931 in Dahl, Tierwelt Deutschlands, 23: 109, figs. 167-170, ♀, ♂. Comstock, 1940, Spider Book, 2nd ed., p. 508, figs. 524, 525, ♀, web. Roewer, 1942, Katalog der Araneae, 1: 798.
- Araniella displicata*, - Chamberlin and Ivie, 1942, Bull. Univ. Utah, biol. ser., 32(13): 76.
- Araniella displicata octopunctata* Chamberlin and Ivie, 1942, Bull. Univ. Utah, biol. ser., 32(13): 76. Female holotype from Emigration Canyon, Wasatch Mts., Utah, in the American Museum of Natural History, paratype, examined.
- Araneus displicatus*, - Locket and Millidge, 1953, British Spiders, 2: 149, figs. 96b, 97c, 99c, 100c-e, ♀, ♂.
- Araneus cucurbitinus displicatus*, - Bonnet, 1955, Bibliographia Araneorum, 2: 478.

*Note.* It is of interest that this species described from Alabama is very rare at the present time in the Gulf states if present at all. Only a juvenile from Bankhead National Forest, Alabama, might be this species. Others collected by Archer in Alabama were *Araneus gadus* Levi that had been misidentified.

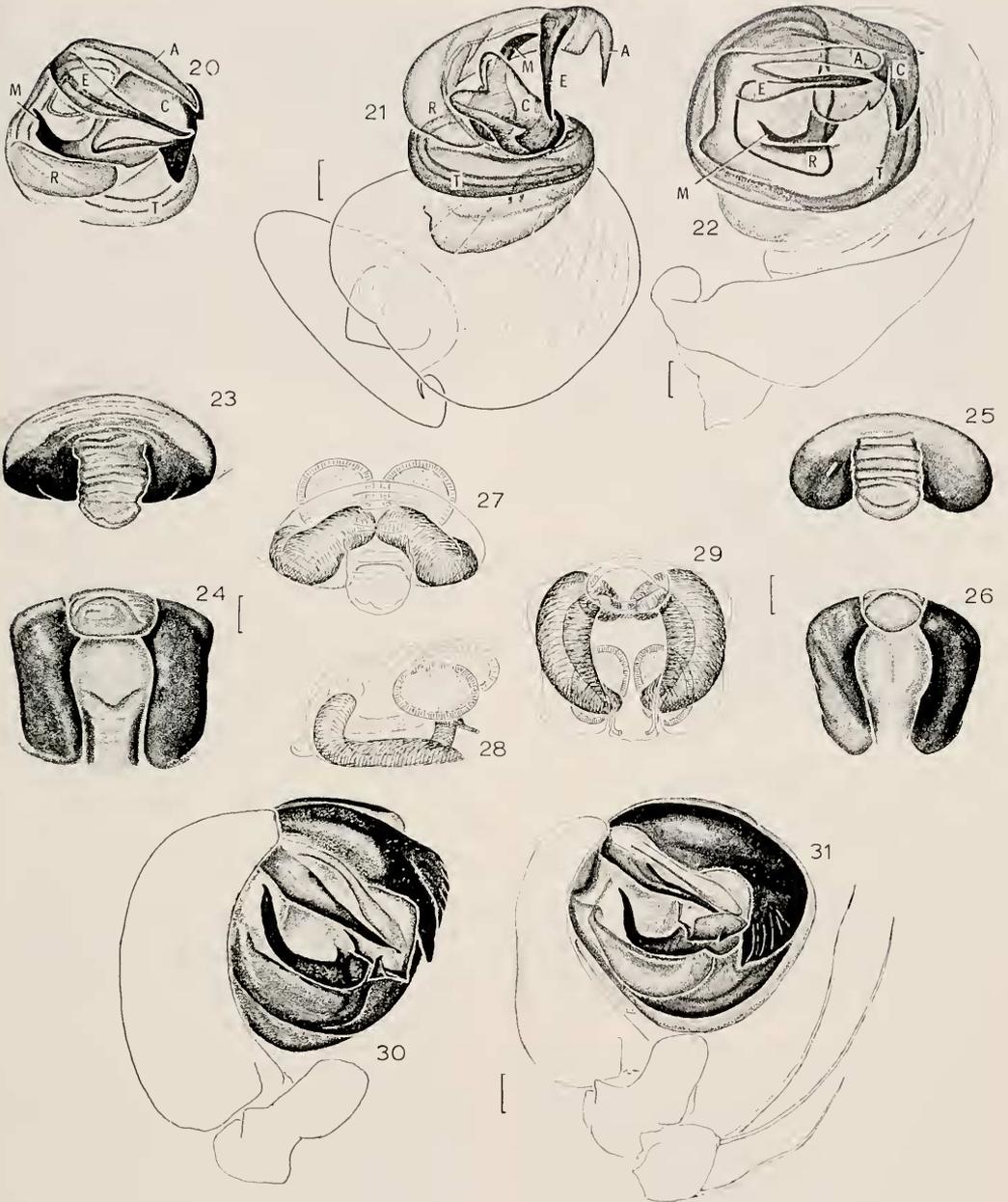
*Description.* Female from California. Carapace yellowish with eyes on black spots. Legs yellow. Dorsum of abdomen yellowish with three pairs of circular black spots on the posterior part (Fig. 1). Carapace smooth, almost without setae. There is no thoracic depression. Diameter of posterior median eyes 1.2 diameters of anterior medians; anterior laterals 0.8 diameters of anterior medians; posterior laterals subequal in size to anterior medians. Anterior median eyes 1.5 diameters apart, 3.2 from laterals. Posterior median eyes one diameter apart, three from laterals. The height of the clypeus is about 1.5 di-

ameters of the anterior median eyes. The chelicerae, which are not very strong, have four teeth on the anterior margin, three on the posterior. The legs are relatively heavy, with many macrosetae. The abdomen is suboval, widest in the middle. Total length 5.3 mm. Carapace 2.5 mm long, 1.9 mm wide. First femur, 1.9 mm; patella and tibia, 2.4 mm; metatarsus, 1.4 mm; tarsus, 0.6 mm. Second patella and tibia, 2.2 mm; third, 1.3 mm; fourth, 2.2 mm.

Male from California. Coloration as in female, except legs tend to be banded or distal ends of leg articles darker. Carapace smooth with head region relatively high and a shallow thoracic depression, having two lines crossing each other at right angles (Fig. 16). Eyes are subequal in size. Anterior median eyes 1.7 diameters apart, two from laterals. Posterior median eyes their diameter apart, 2.5 from laterals. The height of the clypeus is 1.5 diameters of the anterior median eyes. Total length 4.0 mm. Carapace 1.8 mm long, 1.7 mm wide. First femur, 1.8 mm; patella and tibia, 2.3 mm; metatarsus, 1.3 mm; tarsus, 0.6 mm. Second patella and tibia, 2.0 mm; third, 1.2 mm; fourth, 1.9 mm.

*Variation.* Total length of females 4.8 to 7.2 mm. Carapace 2.0 to 2.7 mm long, 1.7 to 2.0 mm wide. Total length of males 4.0-5.0 mm. Carapace 2.0-2.4 mm long, 1.7-2.2 mm wide. The coloration is much more variable than the size; it is often greenish, reddish, brownish or yellowish on the abdomen. This pigment washes out, however, and in alcohol the abdomen is generally white.

*Diagnosis.* This is probably the only species of *Araniella* occurring in North America, although *A. cucurbitina* may occur in northern Canada and Alaska. *Araniella displicata* females can be separated by the wider and longer scape, which often hides the base of the epigynum; the widest part of the scape is generally toward its middle (Figs. 8-14). In posterior view the base is shorter, wider (Figs. 9, 11, 13, 15) than that of *A. cucurbitina*.



Figures 20–21. *Araniella displicata* (Hentz). 20. Left male palpus, ventral view without cymbium, cleared. 21. Palpus expanded.

Figures 22–31. *A. cucurbitina* (Clerck). 22. Male palpus, expanded. 23–26. Epigynum. 23, 25. Ventral. 24, 26. Posterior. 23, 24. (Taurus, Germany.) 25, 26. (Scotland.) 27–29. Epigynum cleared. 27. Ventral. 28. Lateral. 29. Posterior. 30, 31. Palpus, mesal. 30. (Poland.) 31. (Germany.)

**Abbreviations.** A, terminal apophysis; C, conductor; E, embolus; M, median apophysis; R, radix; T, tegulum.

**Scale lines.** 0.1 mm.

Males can readily be separated from *A. cucurbitina* and other species by the shape of the conductor, which holds the tip of the embolus and terminal apophysis (Figs. 17–21). That of *A. displicata* has several large teeth around its margin while a special lobe on the conductor of *A. cucurbitina* holds the tip of embolus and terminal apophysis (Figs. 22, 30, 31). The main sclerotized part of the conductor of *A. cucurbitina* has just one tip.

*Habits.* Males are mature from late spring until late summer, females until fall. The spider is found by sweeping meadows and low bushes. This species makes a relatively small orb web, often among the leaves of bushes or underneath a single large leaf.

*Distribution.* Europe, North America, from the Arctic to North Carolina, probably Alabama, and Arizona in the south; but apparently absent from the south-central states, southern Iowa, Nebraska to the Gulf (Map 1).

*Araniella cucurbitina* (Clerck)  
Figures 22–31

*Araneus cucurbitinus* Clerck, 1757, *Aranei Svecici*, p. 44, pl. 2, fig. 4, ♀. Clerck's specimens in the Natural History Museum of Stockholm, originally pinned and labeled by Thorell, not examined. Locket and Millidge, 1953, *British Spiders*, 2: 144, figs. 96a, 97b, 98a, 99a, ♀, ♂. Bonnet, 1955, *Bibliographia Araneorum* 2: 472 (in part).

*Epeira proxima* Kulczyński, 1885, *Pamięt. Akad. Umiejet. Kraków*, 11: 19, pl. 9, fig. 11. Male holotype from Kamchatka in the Polish Academy of Sciences, examined. NEW SYNONYMY.

*Araneus cucurbitina opisthographa* Kulczyński, 1905, *Bull. Acad. Sci. Cracovie*, p. 232, pl. 7, figs. 2, 20, 23, 26, ♀, ♂. Syntypes from numerous localities in Poland in the Polish Academy of Sciences, Warsaw, examined.

*Aranea cucurbitina*, - Wiehle, 1931, in *Dahl, Tierwelt Deutschlands*, 23: 106, figs. 161, 164, ♀, ♂. Roewer, 1942, *Katalog der Araneae*, 1: 785.

*Aranea proxima*, - Roewer, 1942, *Katalog der Araneae*, 1: 790.

*Araneus proximus*, - Bonnet, 1955, *Bibliographia Araneorum*, 2: 571.

*Note.* I could not find any consistent differences between specimens labeled *opisthographa* and others. Figure 30 was prepared from a syntype of *A. opisthographa*.

*Diagnosis.* The short, narrow scape with parallel sides which exposes most of the base of the epigynum in ventral view (Figs. 23–26) readily separates *A. cucurbitina* from other *Araniella* females. The more complex conductor with a distinct, separate lobe holding the tip of embolus and terminal apophysis (Figs. 22, 30, 31) distinguishes males (from other *Araniella* species).

*Natural history.* Very common in trees and bushes in Europe (see Wiehle, 1931).

*Distribution.* Common and widespread in Eurasia from Great Britain to Kamchatka (Wiehle, 1931; Locket and Millidge, 1953). The species is believed not to occur in North America. The single record is probably the result of comparing specimens and misplacing them, or perhaps the species may occur in poorly collected Alaska and northern Canada. The female was from Fort Smith, Northwest Territory, 20.VI. 1967 (R. Leech), in white poplar.

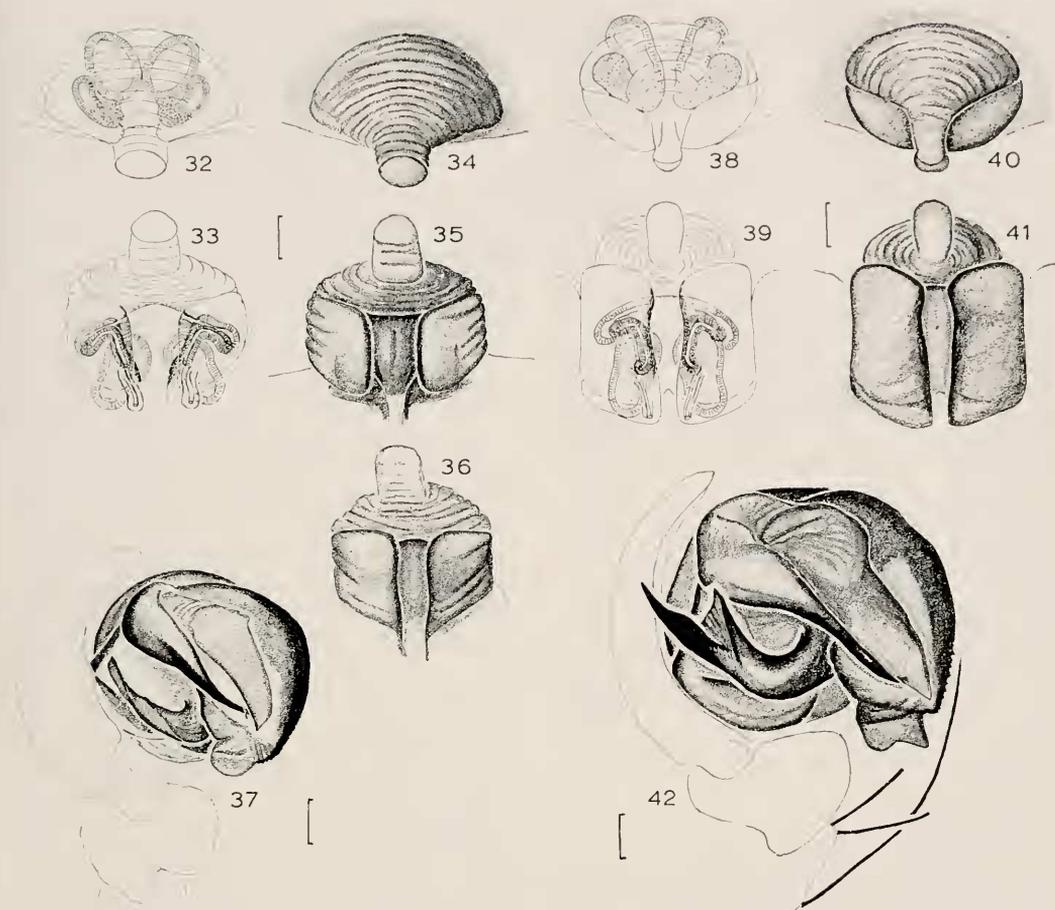
*Araniella inconspicua* (Simon)  
Figures 32–37

*Epeira inconspicua* Simon, 1874, *Arachnides de France*, 1: 84. Female type in the Muséum National d'Histoire Naturelle, Paris, not examined.

*Aranea inconspicua*, - Wiehle, 1931, in *Dahl, Tierwelt Deutschlands*, 23: 112; figs. 174–176, ♀, ♂. Roewer, 1942, *Katalog der Araneae*, 1: 787.

*Araneus inconspicuus*, - Locket and Millidge, 1953, *British Spiders*, 2: 146; figs. 97a, 98c, 99d, 100b, ♀, ♂. Bonnet, 1955, *Bibliographia Araneorum*, 2: 521.

*Diagnosis.* The abdomen usually lacks the black spots. The female has a triangular wrinkled scape that completely hides the base in ventral view (Fig. 34); in posterior view, the median groove is shorter (Figs. 35, 36) than that of *A. alpica*. The palpus lacks the distally directed fin of



Figures 32-37. *Araniella inconspicua* (Simon). 32-36. Epigynum. 32. Ventral, cleared. 33. Posterior, cleared. 34. Ventral. 35, 36. Posterior. 32-35. (France.) 36. (England.) 37. Left male palpus, mesal.

Figures 38-42. *A. alpica* (L. Koch). 38-41. Epigynum. 38. Ventral, cleared. 39. Posterior, cleared. 40. Ventral. 41. Posterior. 42. Male palpus, mesal.

Scale lines. 0.1 mm.

the median apophysis (Fig. 37) present in *A. alpica*. While Continental specimens are readily separated from *A. alpica*, this is not true for those of the British Isles. Perhaps as a result of a recent introduction of *A. alpica* they hybridize.

*Natural history.* Found in trees and bushes at low elevations (Wiehle, 1931).

*Distribution.* Europe from Great Britain, northern Spain to Macedonia (Wiehle, 1931). There are also references to *A.*

*inconspicua* occurring in eastern Asia (Bonnet, 1955).

#### *Araniella alpica* (L. Koch) Figures 38-42

*Epeira alpica* L. Koch, 1869, Z. Ferdinandeum Tirol., (3)14: 173. Specimens from Tyrol and other localities in the Koch collection of the British Museum (Natural History); presumably types but not examined.

*Aranea alpica*, - Wiehle, 1931, in Dahl, Tierwelt Deutschlands, 23: 110, figs. 171-173, ♀, ♂. Roewer, 1942, Katalog der Araneae, 1: 781.

*Araneus alpicus*, - Locket and Millidge, 1953, British Spiders, 2: 149, figs. 96c, 98d, 99b, 100a, ♀, ♂. Bonnet, 1955, Bibliographia Araneorum, 2: 428.

*Araniella alpica*, - Archer, 1951, Natur. Hist. Misc., 84: 3, fig. 4, ♂.

**Diagnosis.** In ventral view the base of the epigynum shows as two bulges posterior and lateral to the scape (Fig. 40). In posterior view the central area is much longer (Fig. 41) than that of *A. inconspicua*. The median apophysis has a distally directed fin (Fig. 42) and the terminal apophysis is wider than that of other species. The abdomen has at most four black spots (see note under *A. inconspicua* diagnosis).

**Natural history.** This species is found in European mountains above 300 m to krummholz (1800 m in the alps) and is limited to fir and spruce. Males are mature until August (Wiehle, 1931).

**Distribution.** Great Britain (Locket and Millidge, 1953), Scandinavia, Central Europe (Wiehle, 1931), Balkans (Bonnet, 1955).

### *Nuctenea* Simon

*Nuctenea* Simon, 1864, Histoire Naturelle des Araignées, p. 261. New subgenus of *Epeira* with the type species *Epeira umbratica* designated by Bonnet, 1950, Bibliographia Araneorum, 2: 3118. The name is of feminine gender. *Cyphepeira* Archer, 1951, Natur. Hist. Misc., Chicago, 84: 4. New subgenus of *Epeira* with the type species by original designation *Epeira (Cyphepeira) silvicultrix* C. L. Koch. The name is of feminine gender.

**Note.** The species included here had been placed by Wiehle (1931) in groups 4 and 5 of *Aranea*, by Locket and Millidge (1953) in groups 3 and 5 of *Araneus*. Archer (1951), following F. P.-Cambridge (1903), considered the group a distinct genus, *Epeira*, with *Araneus cornutus* (Clerck) the type of the genus. But this type designation is an error as *Epeira* is an objective synonym of *Aranea* and a subjective synonym of *Araneus*, having *Epeira*

*diademata* as type designated by Latreille, 1810 (Levi, 1971).

In considering the group included here as distinct, I am following older authors and also Archer. In 1959 Yaginuma and Archer included the species in *Cyphepeira*, as did Prószyński and Staręga (1971). Wiehle (1927), discussing orb-web building, included *Epeira umbratica*, *E. scolopetaria*, *E. cornuta* and *E. patagiata* in a group making an *umbraticus*-type web. Gerhardt (1926) separated the group because of different mating behavior: males can mate three or four times with each palpus. *Araneus* species can mate only once with each palpus. Also, the female assumes a different mating position, approaching and hanging opposite the male, with cephalothorax lowered and abdomen raised, and pulls in the male on threads. The male will court a female that does not have an orb-web, and in mating the male's body is not as close to the female's as in *Araneus*. Males do not refill their palpi with sperm immediately after mating, as males of *Araneus* have been observed to do (observations on *N. umbratica*, *N. cornuta*, *N. scolopetaria*).

**Description.** All species are gray to brown, none brightly colored (Plate 2). The abdomen is dorsoventrally flattened, oval in outline, widest in the middle, with a folium on the dorsum (Figs. 97-109). The cardiac mark is usually dark. The venter of the abdomen is black with a pair of comma-shaped or bracket-shaped white marks (Figs. 98, 99, 102, 104).

The genitalia are heavily sclerotized. The opening of the epigynum is hard to find and the connecting duct difficult to make out, even in epigyna digested with 10 percent NaOH. The openings of the *N. umbratica* epigynum are anterior on the base (Figs. 45, 46), those of other species, posterior in a groove (Figs. 71, 72, 81, 82, 85, 86).

The palpus has a simple conductor (C in Figs. 58-62), unlike that of *Araniella* (Figs.

20, 22) and even simpler than that of *Araneus*. A complex terminal apophysis shields the embolus from above (A in Figs. 58-62) and is connected to the bulb by distal hematodocha. The distal hematodocha may be sclerotized, and reveals its origin by the presence of folds and grooves. Despite sclerotization, parts of it expand (Figs. 58, 61, 62). The embolus lacks a cap and is a relatively simple structure. The tiny structure visible on the opening of the embolus (Figs. 119, 122, 123, 125) is found only in mated males and is presumably dried up sperm fluid. The median apophysis is on the mesal side and may project (except in *N. umbratica*). In most species it is biforked (Figs. 61, 62, 110-117, 126-129). It is a simple projection in *N. silvicultrix* (Figs. 55, 60) and a lancet-shaped, appressed sclerite in *N. umbratica* (M in Fig. 58). Males have a hook on the distal margin of the first coxa and a corresponding depression on the second femur; also the second tibia may be swollen and bear macrosetae.

*Diagnosis.* In the Americas the species of *Nuctenea* can be confused only with those of *Metazygia*. However, the carapace of *Nuctenea* is setose (Figs. 105-109), that of *Metazygia* lacks setae. Unlike most species of *Araneus*, *Nuctenea* species have the abdomen dorsoventrally flattened, oval in outline, and widest in the middle with a dorsal folium. The venter is black between genital furrow and spinnerets, enclosing a white, comma-shaped mark on each side (Figs. 97-109). The cardiac mark on the abdomen, if present, is dark, not light as it often is in *Araneus*. The only *Araneus* species that have the abdomen oval are marked differently. More important, *Nuctenea* genitalia are much more sclerotized, and the embolus lacks a cap. Externally the epigynum base seems more complex (Figs. 43-46, 50-54, 71-76, 81-92) than in *Araneus* and *Metazygia*. The *Metazygia* epigynum lacks the scape present in *Nuctenea*; in its place there is a ventrally extended, laterally flattened lobe with the

opening on each side of the base. The palpus of *Metazygia* has a terminal apophysis with a large proximal part and is very different from that of *Nuctenea*. The palpal femur lacks the basal ventral tooth present in *Araneus* and *Araniella* but has a corresponding tooth on the side of the endite.

*Natural history.* *Nuctenea* species, at least those found in North America, may be mature the year around; adult males can be found at all seasons. In contrast, in all *Araneus* species observed in the temperate region, mature males can be found only during a short period of the year. Males, as well as females, can mate numerous times; species belonging to *Araneus*, to judge by the work of U. Gerhardt (Levi, in preparation), can mate only twice, once with each palpus, perhaps three times if the mating was unsuccessful. No doubt these differences in habits are a result of the cap, which is found on the embolus of *Araneus*, and is absent in *Nuctenea*.

The species all build in the evening and are nocturnal. The webs of all the species have few radii (fewer than 20) with few viscous threads, widely separated; those of adult *N. umbratica* are separated by 10 mm or more. Thus the web, especially in wind, gives the impression of being a flimsy structure. The center is small with rough threads and few scaffolding threads. Although usually made nearly vertical, the web may be horizontal (*N. cornuta*, Plate 2). All species make a retreat or sit near the web during the day, in the web at night.

In the northeastern United States the species are commonly found on houses. Comstock (1912, 1940) refers to these spiders as the House Araneas, J. H. Emerton calls them House Epeiras. But, as Comstock points out, they are often found in suitable habitats far away from houses.

In America the species have a wide distribution, *N. cornuta* from the Arctic to the tropics. Only *N. sclopetaria* appears introduced; the other two species,

though they are commonly found on buildings and in trash (Maps 2-4), as introduced species often are, have a continuous Holarctic distribution.

*Misplaced species. Epeira carolinialis* Archer, 1951, Amer. Mus. Novitates, No. 1487: 40, fig. 57, ♀, may belong to the genus *Metazygia*. The male is not known.

#### KEY TO SPECIES OF *NUCTENA*

- 1 Male with median apophysis of palpus split into two branches (Figs. 110-117); female with scape of epigynum originating at anterior of base (Figs. 71-91) ..... 3
- Male with median apophysis of palpus not split into two branches (Figs. 47, 48, 55, 56, 58, 60); female with scape originating in center of base or lacking scape (Figs. 43, 51); Eurasia, North Africa ..... 2
- 2(1) Terminal apophysis of male palpus a massive shield (Figs. 48, 49, 58); median apophysis spindle-shaped (Figs. 47, 58); epigynum with triangular scape pointing posteriorly (Fig. 43); Europe and North Africa ..... *umbratica*
- Terminal apophysis of palpus with teeth (Figs. 55, 60); median apophysis a knob (Figs. 55, 60); epigynum with cone-shaped base drawn out anteriorly (Figs. 51, 53); northern, Central Europe to Siberia ..... *silvicultrix*
- 3(1) Males ..... 4
- Females ..... 7
- 4(3) Terminal apophysis a prong with a narrow neck (Figs. 61, 110); embolus with tip hidden by a lamella (Figs. 61, 110, 118, 119), probably cosmopolitan... *cornuta*
- Terminal apophysis a sclerotized lobe without neck (Figs. 112-117); embolus cylindrical (Figs. 112, 114, 116)..... 5
- 5(4) Embolus with a distal, set-off finger (Fig. 116); Central Europe to Iran ..... *ixobola*
- Embolus cylindrical, pointed at end but without set-off finger (Figs. 112, 114, 120-125) ..... 6
- 6(5) Median apophysis massive with the two prongs about of equal width in ventral view (Fig. 113); conductor leaning toward median apophysis (Fig. 113); Holarctic ..... *patagiata*
- Median apophysis more slender with "upper" prong narrower than "lower" one (Fig. 115); conductor bending away from median apophysis (Fig. 115); Holarctic ..... *sclopetaria*

- 7(3) Epigynal base posteriorly corrugated (Fig. 84); scape widest near tip with a narrow neck (Figs. 78-81); Holarctic ..... *patagiata*
- Epigynal base not corrugated (Figs. 74, 76, 88, 92) ..... 8
- 8(7) Epigynum covered by a lamella on each side (Figs. 65-76); base with a ventral, anterolateral fold and swollen posteriorly (Figs. 63, 65, 67, 69, 73, 75); probably cosmopolitan ..... *cornuta*
- Epigynal lamellae not visible in ventral view or hidden behind base (Figs. 85-92); base without anterolateral fold and posterior swelling ..... 9
- 9(8) Anterior part of scape framed by a lip of the base (Fig. 87); Holarctic..... *sclopetaria*
- Anterior part of scape not framed by lips from base, base with anterolateral pockets (Fig. 91); Central Europe to Iran .... *ixobola*

#### *Nuctenea umbratica* (Clerck)

Figures 43-49, 58, 59, 93, 99, 105

*Araneus umbraticus* Clerck, 1757, Aranei Svecici, p. 31, pl. 1, fig. 7, ♀. Clerck's specimens from Sweden in the Museum of Natural History, Stockholm, labeled by Thorell; not examined. Locket and Millidge, 1953, British Spiders, 2: 139, fig. 92, ♀, ♂. Bonnet, 1955, Bibliographia Araneorum, 2: 621.

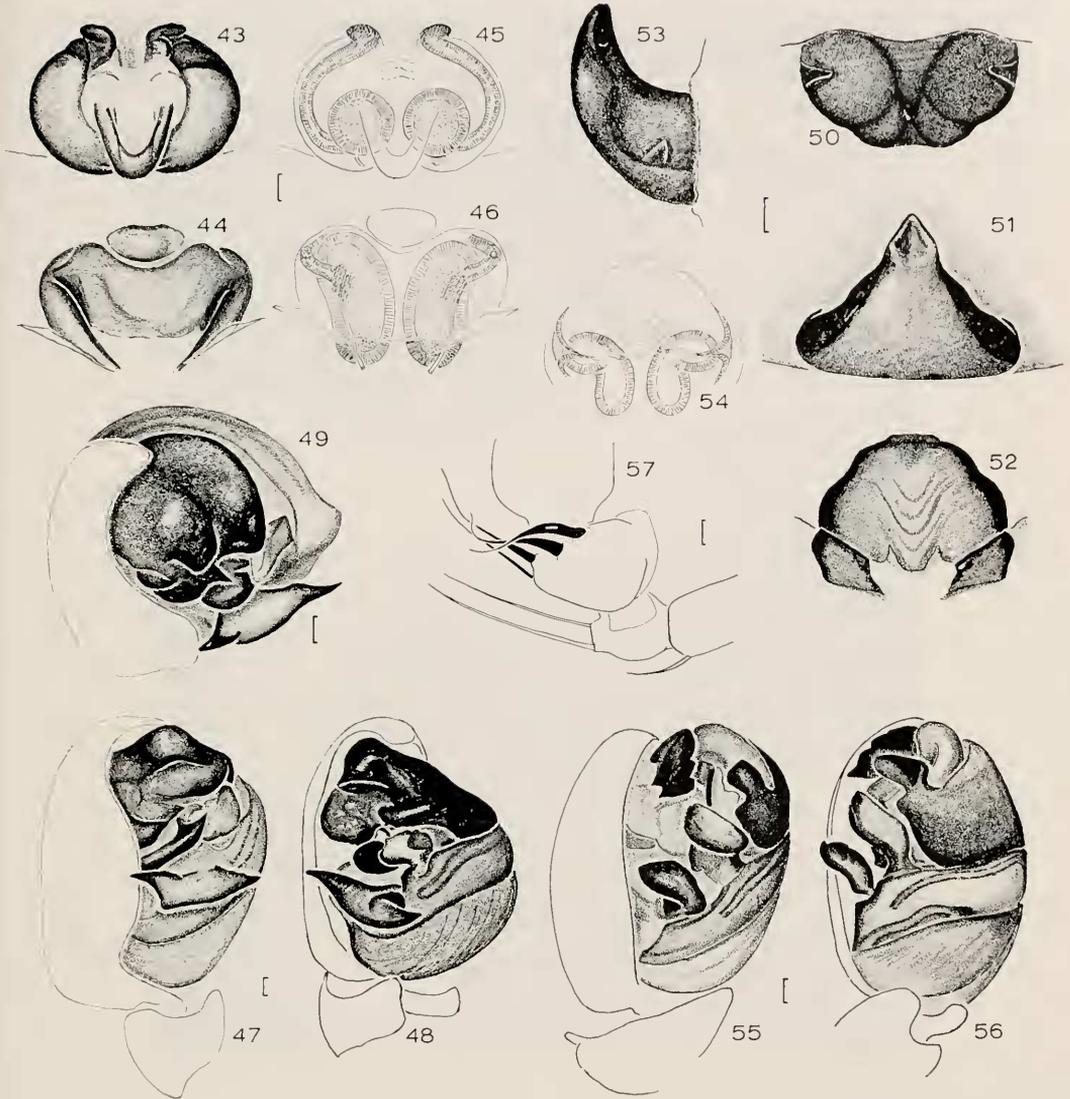
*Aranea sexpunctata* Linnaeus, 1758, Systema Naturae, 10 ed., p. 622. Type specimens believed lost. Wiehle, 1931, in Dahl, Tierwelt Deutschlands, 23: 93, figs. 138-141, ♀, ♂. Roewer, 1942, Katalog der Araneae, 1: 791.

*Epeira (Nuctenea) umbratica*, - Simon, 1864, Histoire Naturelles des Araignees, p. 261.

*Epeira umbratica*, - Nielsen, 1932, The Biology of Spiders, Copenhagen, vol. 2, figs. 299-304, web, egg sac, retreat.

*Chinestcla umbratica*, - Archer, 1951, Natur. Hist. Misc., Chicago, 84. Prószyński and Starega, 1971, Katalog Fauny Polski, 16: 85.

*Description.* Female from England. Carapace dark brown. Legs dark brown, with light bands. Dorsum of abdomen with usual dark brown pattern. Venter black with two lateral white marks. Diameter of posterior median eyes 0.9 diameters of anterior medians, laterals 0.8 diameters of anterior medians. Anterior median eyes their diameter apart, posterior medians slightly more than their diameter apart. Height of clypeus equals about the diameter of the anterior median eyes. The abdo-



Figures 43-49. *Nuctenea umbratica* (Clerck). 43-46. Epigynum. 43. Ventral. 44. Posterior. 45. Ventral, cleared. 46. Posterior, cleared. 47-49. Left male palpus. 47. Mesal. 48. Ventral. 49. Apical.

Figures 50-57. *N. silvicultrix* (C. L. Koch). 50-54. Epigynum. 50. Anterior. 51. Ventral. 52. Posterior. 53. Lateral. 54. Posterior, cleared. 55-57. Male palpus. 55. Mesal. 56. Ventral. 57. Tibial macrosetae.

Scale lines. 0.1 mm.

men is much flattened. Total length 12 mm. Carapace 4.7 mm long, 4.1 mm wide. First femur, 3.9 mm; patella and tibia, 5.8 mm; metatarsus, 3.6 mm; tarsus, 1.8 mm. Second patella and tibia, 5.3 mm; third, 3.0 mm; fourth, 4.6 mm.

Male from England. Coloration as in female, with abdominal pattern more distinct. Diameter of posterior median eyes 0.8 diameters of anteriors. Laterals very slightly smaller than posterior median eyes. Anterior median eyes their diameter apart,

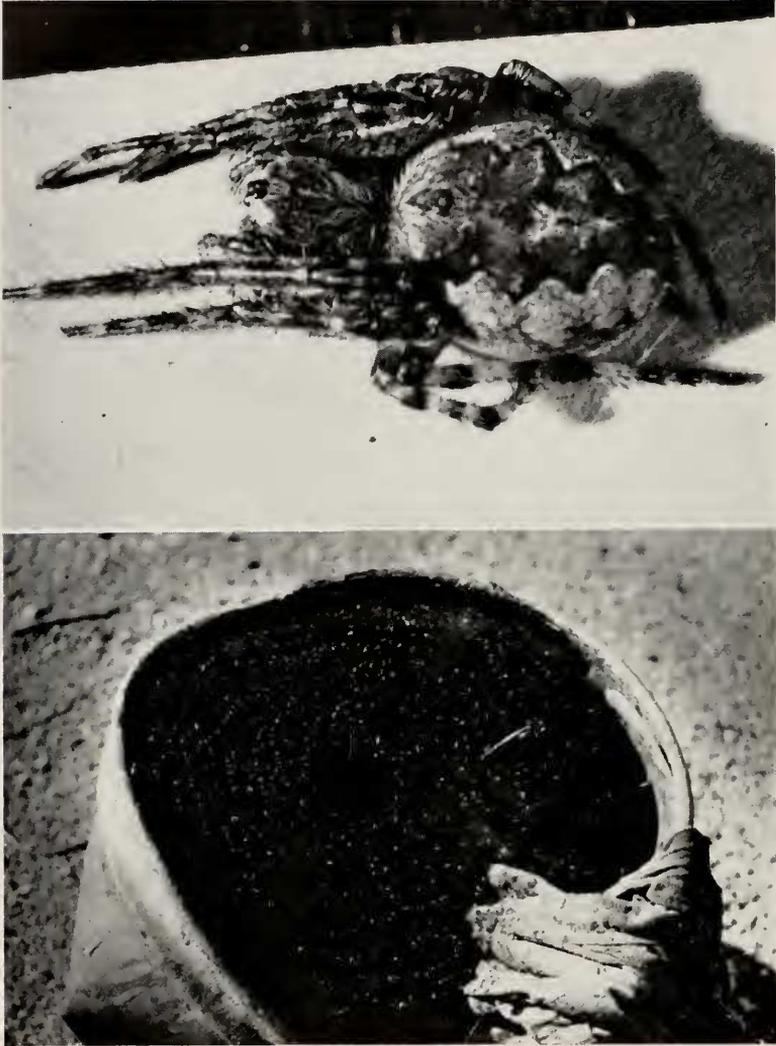


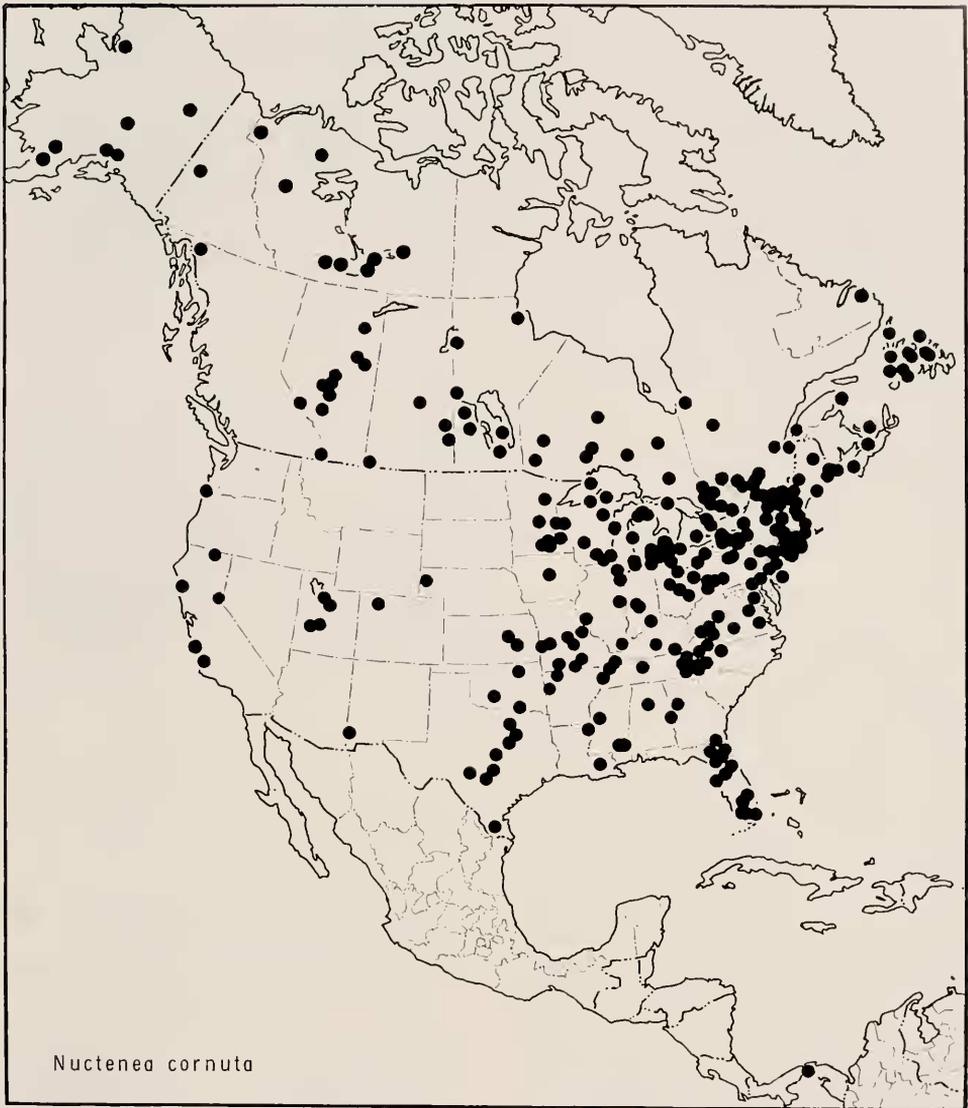
Plate 2. *Nuctenea cornuta* (Clerck). Above, female (Wisconsin). Horizontal web with flies caught (Minnesota).

posterior medians their diameter apart. The height of the clypeus is slightly less than the diameter of the anterior median eyes. Total length 8 mm. Carapace 4.0 mm long, 3.6 mm wide. First femur, 5.2 mm; patella and tibia, 7.3 mm; metatarsus, 5.3 mm; tarsus, 2.0 mm. Second patella and tibia, 5.9 mm; third, 3.0 mm; fourth, 4.7 mm.

*Diagnosis.* *Nuctenea umbratica* is read-

ily separated from the other species of *Nuctenea* by being flatter (Figs. 93, 105), and by the distinct genitalia (Figs. 43-48). The openings of the epigynum, unlike those of other species, are anterior on the base (Figs. 45, 46) and the median apophysis is spindle-shaped (Figs. 47, 48, 58).

*Natural history.* *Nuctenea umbratica* has its retreat in crevices under bark, between



Map 2. North American distribution of *Nuctenea cornuta* (Clerck).

planks, in masonry, in barns, houses and greenhouses, up to 820 m in the Alps, but in southern Switzerland to 1200 m (Wiehle, 1931). Mature females can be found at all seasons, males from June until October. The eggs are laid in a flattened ball surrounded by loose, woolly silk.

The web is more eccentric than that of

*N. patagiata*, with the center closest to the retreat. The viscous threads may span 70 cm and there are about 20 radii. There is a line to the retreat. The animal is strictly nocturnal (Wiehle, 1927, 1931). Mating has been described by Gerhardt, 1926.

*Distribution.* *Nuctenea umbratica* is only found in Europe and North Africa.

*Nuctenea silvicultrix* (C. L. Koch),  
new combination  
Figures 50–57, 60, 106

*Epeira silvicultrix* C. L. Koch, 1845, *Die Arachniden*, 11: 131, pl. 932, 933, ♀, ♂. In the Berlin Museum are specimens from the L. Koch collection, presumably from Nürnberg, but no specimens that can readily be interpreted as types of C. L. Koch. The British Museum (Natural History) has specimens from Nürnberg belonging to the L. Koch collection and presumably the types. They were not examined.

*Aranea silvicultrix* Wiehle, 1931, in Dahl, *Tierwelt Deutschlands*, 23: 96, figs. 142–145, ♀, ♂. Roever, 1942, *Katalog der Araneae*, 1: 792.

*Araneus silvicultrix*, - Bonnet, 1955, *Bibliographia Araneorum*, 2: 598.

*Epeira (Cyphepeira) silvicultrix*, - Archer, 1951, *Natur. Hist. Misc.*, Chicago, 84: 4.

*Cyphepeira silvicultrix*, - Yaginuma and Archer, 1959, *Acta Arachnol.*, 16: 41, fig. 12, ♂. Prószyński and Staręga, 1971, *Katalog Fauny Polski*, 16: 85.

**Description.** Female from Schönheid [near Neustadt, Bavaria]. Carapace red-brown, head lighter, with a double, median, longitudinal darker line. White setae in the head region. The legs are indistinctly banded with narrow, light bands. The dorsum of abdomen has a black folium outlined by white. The venter is black with a white mark on each side. The diameter of the posterior median eyes is 0.8 diameters of anterior medians, laterals about 0.6 diameters. The anterior median eyes are about their diameter apart; the posterior medians slightly less than one diameter. The ocular quadrangle is slightly longer than wide, much narrower behind than in front. The clypeus slants back and its height is about equal to or slightly less than the diameter of anterior median eyes. The opening of the epigynum appears to be on the side of the base and is quite difficult to see. Total length 7.0 mm. Carapace 3.1 mm long, 2.8 mm wide. First femur, 3.0 mm; patella and tibia, 3.9 mm; metatarsus, 2.7 mm; tarsus, 0.9 mm. Second patella and tibia, 3.6 mm; third, 2.1 mm; fourth, 3.3 mm.

Male from Erlangen, Bavaria. Coloration as in female. There is a shallow, round

thoracic depression. Posterior and anterior median eyes subequal in size, laterals 0.8 diameters of medians. The anterior median eyes are one diameter apart; posterior medians also one diameter apart. The height of the clypeus equals slightly less than the diameter of the anterior median eyes. Total length, 5.8 mm. Carapace 3.2 mm long, 2.6 mm wide. First femur, 3.8 mm; patella and tibia, 5.0 mm; metatarsus, 3.7 mm; tarsus, 1.5 mm. Second patella and tibia, 4.0 mm; third, 2.3 mm; fourth, 3.4 mm.

**Diagnosis.** The epigynum is triangular, anteriorly extended (Figs. 50–54); the terminal apophysis (Figs. 55, 60) and strong setae on the palpal tibia (Fig. 57) separate this species from other *Nuctenea*.

**Natural history.** In northern Bavaria the species is found among lichens on stunted pines growing on infertile, moist ground; it uses crevices as retreats. Mature males are collected in April, May and again in July and August. The web is similar to that of *N. umbratica* (Wiehle, 1931).

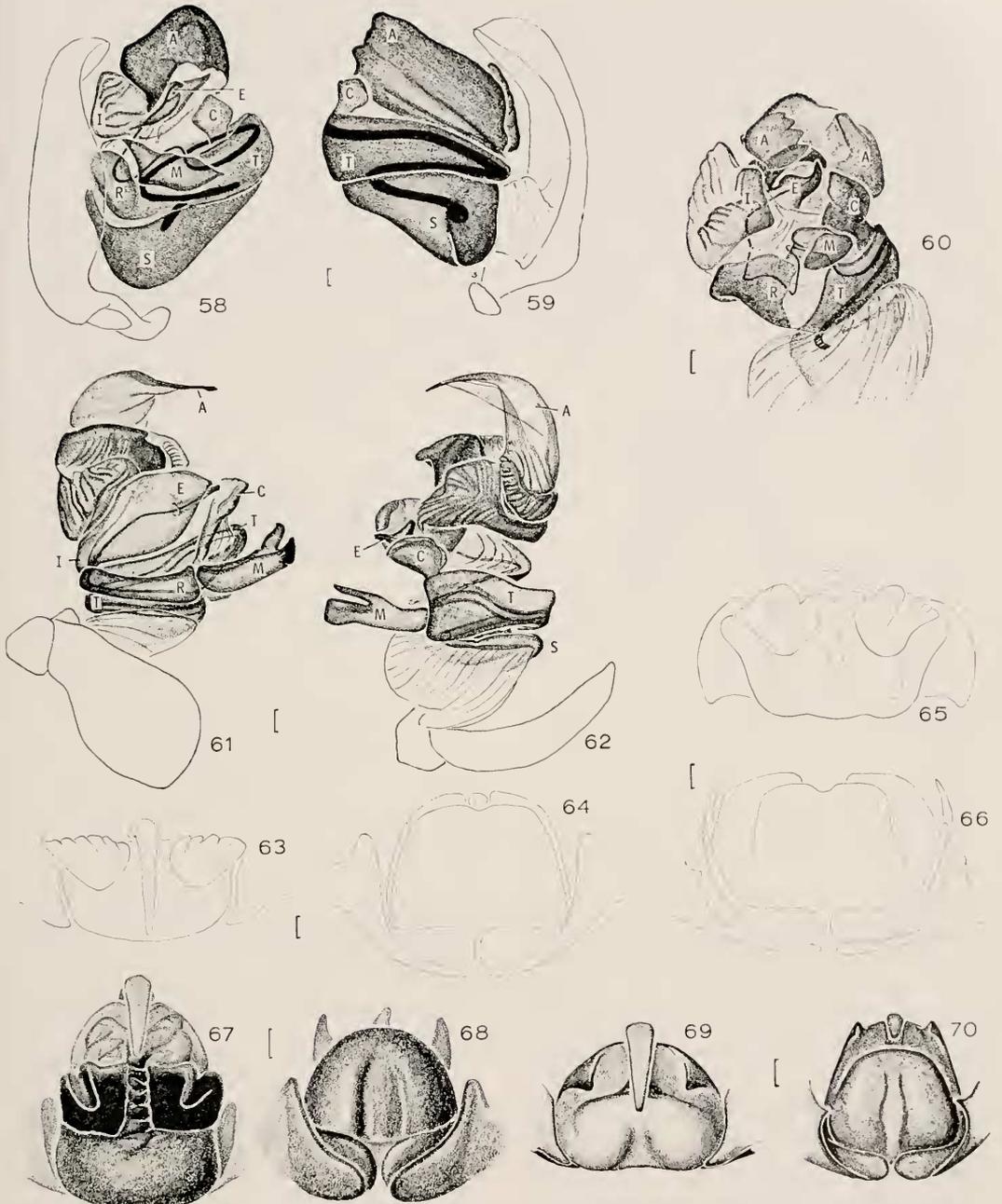
**Distribution.** Norway, Finland, Germany, Switzerland to Balkans, Ural Mountains and Turkmen (Bonnet, 1955).

*Nuctenea cornuta* (Clerck), new  
combination, Furrow Spider  
Plate 2; Figures 61–76, 94, 97–98,  
110–111, 118–119, 126; Map 2\*

*Araneus cornutus* Clerck, 1757, *Aranei Svecici*, p. 39, pl. 1, fig. 11, ♀. Female types from Sweden lost. Locket and Millidge, 1953, *British Spiders*, 2: 134, figs. 88a, 89b, 90c, ♀, ♂. Bonnet, 1955, *Bibliographia Araneorum*, 2: 463.

*Aranea foliata* Fourcroy, 1785, *Entomologia Parisiensis*, 533. Type specimen from Paris, France,

\* Correction, July 1974. K. Thaler recently found that what has been called *Araneus cornutus* in Europe in fact represents two species, a northern one and a southern one (*Zool. Anz.*, in press). The American specimens are all like the northern European *N. cornuta*. I have examined specimens sent by K. Thaler and agree with his conclusions. Figures 63–66 of this paper thus do not belong to *N. cornuta*.

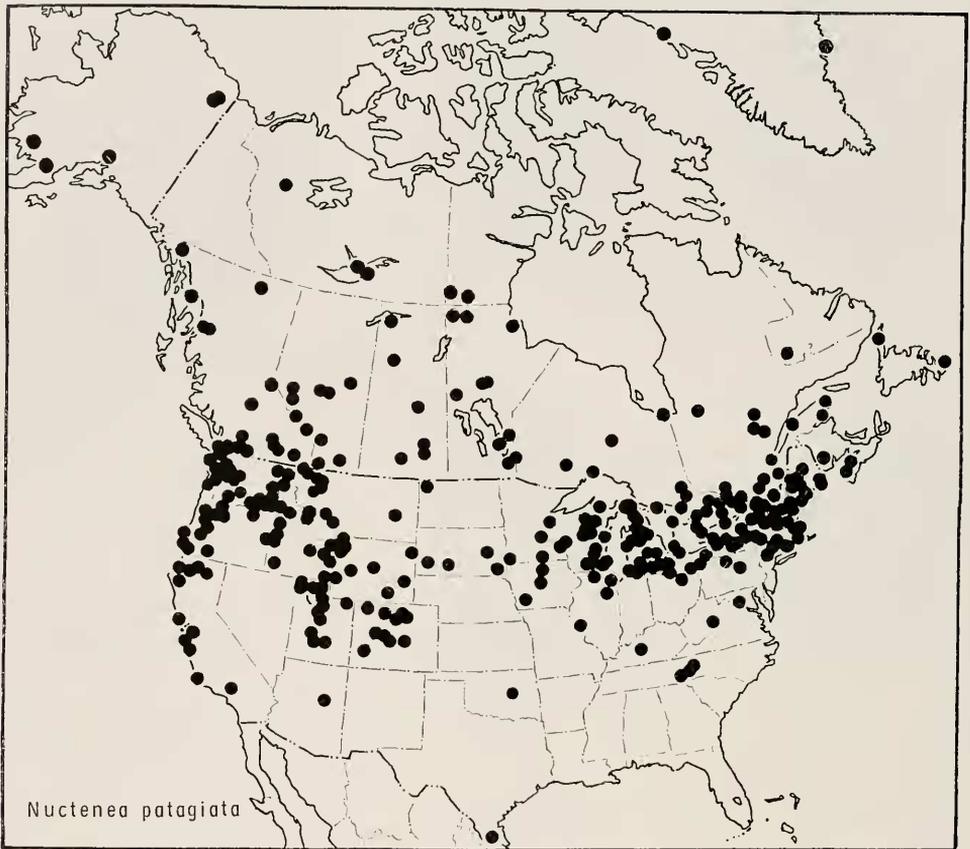


Figures 58-62. *Nuctena* expanded left male palpus. 58, 59. *N. umbratica* (Clerck). 60. *N. silvicultrix* (C. L. Koch). 61, 62. *N. cornuta* (Clerck).

Figures 63-70. *N. cornuta* (Clerck), epigynum, variation. 63, 65, 67, 69. Ventral. 64, 66, 68, 70. Posterior. 63-66. (Burgenland, Austria.) 67, 68. (Kamchatka.) 69, 70. (Poland.)

**Abbreviations.** A, terminal apophysis; C, conductor; E, embolus; I, stipes; M, median apophysis; R, radix; S, subtegulum; T, tegulum.

**Scale lines.** 0.1 mm.



Map 3. North American distribution of *Nuctenea patagiata* (Clerck).

- believed lost. Wiehle, 1931, in Dahl, Tierwelt Deutschlands, 23: 86, figs. 124–127, ♀, ♂. Roever, 1942, Katalog der Araneae, 1: 800.
- ?*Epeira frondosa* Walckenaer, 1841, Histoire Naturelle des Insectes, Aptères 2: 65. The type is Abbot's manuscript illustration, fig. 326, from Georgia in the British Museum, Natural History, copy in the Museum of Comparative Zoology, examined.
- Epeira strix* Hentz, 1847, J. Boston Natur. Hist. Soc., 5: 473, pl. 31, fig. 5, ♀. Type specimens from Pennsylvania and Alabama destroyed.
- Epeira vicaria* Kulezyski, 1885, Pam Akad. Umiej. Kraków, 11: 5. Female holotype from Kamchatka in the Polish Academy of Sciences, examined.
- Aranea frondosa*, - Comstock, 1912, Spider Book, p. 487, figs. 104–106, 128, 186, 194, 509, 513–516, ♀, ♂, web; 1940, *op. cit.*, rev. ed., p. 501, figs. 104–106, 128, 186, 194, 509, 513–516, ♀, ♂, web.
- Epeira comuta*, - Nielsen, 1932, The Biology of Spiders, Copenhagen, vol. 2, figs. 289, 290, retreat.
- Epeira foliata*, - Kaston, 1948, Connecticut Geol. Natur. Hist. Surv. Bull., 70: 254, figs. 787, 803, 812, 2043, ♀, ♂, web.
- Cyphopeira comuta*, - Yaginuma and Archer, 1969, Acta Arachnol., 16: 41. Prószyński and Staręga, 1971, Katalog Fauny Polski, 16: 82.

Note. Figures 67, 68 were prepared from the holotype of *A. vicaria*.

Variation. Total length of females 6.5–14.0 mm. Carapace 2.4–5.0 mm long, 1.9–4.5 mm wide; first patella and tibia, 2.6–5.8 mm long. The total length of males 4.7–8.5 mm. Carapace 2.1–4.2 mm long, 1.8–3.5 mm wide; first patella and tibia 3.0–6.0 mm. The smallest American speci-

mens come from Alaska, the largest from the area of New England to Texas.

**Diagnosis.** The two anterior lateral lobes of the base of the epigynum are bent over and face posteriorly (Figs. 63, 65, 67, 69, 73, 75). (Those of *N. scolopetaria* are not bent over.) The posterior face of the epigynum is smooth (Figs. 74, 76), not grooved as in *N. patagiata*. The palpal terminal apophysis has a prong with a tip wider than its neck (Figs. 61, 110); in *N. scolopetaria* and *N. patagiata* it is wide. The embolus of *N. cornuta* has a wide lamella toward the mesal side (Figs. 61, 110, 118, 119) while in *N. scolopetaria* and *N. patagiata* it is simple and cylindrical.

**Natural history.** The web is found around houses, frequently in bushes (Comstock, 1912), often near water (Wiehle, 1931; Kaston, 1948); it has 15–20 spokes and is up to 60 cm in diameter (Kaston, 1948). It is illustrated by figure 516 in Comstock (1912) and by Kaston (1948). The web is made at night, when the spider leaves its retreat. The silken retreat may be in crevices of walls, on railings, or among plants. The retreat has been illustrated by Nielsen (1932). Both sexes are mature all summer, from March in the southern part of the range; males are more commonly mature in spring and late fall (Kaston, 1948). Egg sacs, according to Kaston (1948), are 7–10 mm in diameter, covered with yellowish threads, hidden in the retreat, and contain 50 to 250 eggs. A female may make as many as ten egg sacs.

**Distribution.** Holarctic, perhaps carried by man worldwide. In North America it occurs from the Arctic to Central America, but is most common in the eastern U.S. and Canada, Newfoundland to Florida (Map 2).

*Nuctenea patagiata* (Clerck),  
new combination

Figures 77–84, 100–102, 107, 112–113,  
120–123, 127; Map 3

?*Araneus ocellatus* Clerck, 1757, *Aranei Svecici*, p. 36, pl. 1, fig. 9, ♀. Female holotype from

Sweden, lost. Bonnet, 1955, *Bibliographia Araneorum*, 2: 555.

*Araneus patagiatus* Clerck, 1757, *Aranei Svecici*, p. 38, pl. 1, fig. 10, ♀. Locket and Millidge, 1953, *British Spiders*, 2: 136, figs. 89c, 90b, ♀, ♂.

*Aranea dumetorum* Fourcroy, 1785, *Entomologia Parisiensis*, p. 531. Type from Paris, France, believed lost. Wiehle, 1931, in Dahl, *Tierwelt Deutschlands*, 23: 88, figs. 128, 129, ♀, ♂.

*Epeira ithaca* McCook, 1893, *American Spiders*, 3: 152, pl. 4, fig. 3, ♂. Male lectotype from Ithaca, New York, in the Academy of Natural Sciences, Philadelphia, examined. NEW SYNONYMY.

*Aranea ocellata*, - Comstock, 1912, *Spider Book*, p. 489, figs. 107, 517–518; 1940, *op. cit.*, rev. ed., p. 503, figs. 107, 517–518, ♀, ♂.

*Epeira patagiata*, - Nielsen, 1932, *The Biology of Spiders*, Copenhagen, vol. 2, fig. 305, web.

*Epeira dumetorum*, - Kaston, 1948, *Connecticut Geol. Natur. Hist. Surv. Bull.*, 70: 255, figs. 788, 804, 813, ♀, ♂.

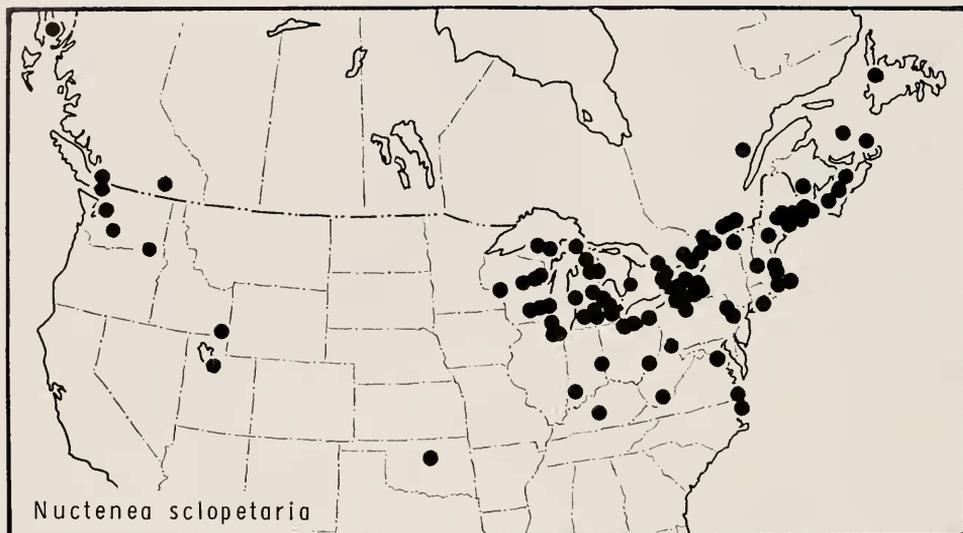
*Cyphopeira patagiata*, - Yaginuma and Archer, 1969, *Acta Arachnol.*, 16: 41. Prószyński and Staręga, 1971, *Katalog Fauny Polski*, 16: 84.

**Note.** According to Bonnet (1955), C. L. Koch, 1845 (*Die Arachniden*, 11: 115) was the first revisor, synonymizing the two names of Clerck and choosing the name *patagiata*.

**Variation.** Total length of females 5.5–11.0 mm. Carapace 2.5–4.0 mm long, 2.2–3.3 mm wide; first patella and tibia, 3.5–5.2 mm. Total length of males 5.8–6.5 mm. Carapace 2.9–3.8 mm long, 2.3–3.1 mm wide; first patella and tibia, 4.5–5.5 mm.

**Diagnosis.** Females are separated from the other species by the epigynum: its base is furrowed posteriorly and its scape has a narrow neck (Figs. 78–84). The male differs from *N. cornuta* by having the terminal apophysis a flat lobe (as in *N. scolopetaria*); it differs from both the other species in having a deep division in the heavy median apophysis (Figs. 112, 113, 127) and in having a finger-shaped embolus (Figs. 112, 120–123).

**Natural history.** Kaston (1948) indicates that its habits are similar to those of *N. cornuta*. According to Wiehle (1931) the web has 20–24 spokes with about 16 viscid threads above, and 23 below center;



Map 4. North American distribution of *Nuctenea sclopetaria* (Clerck).

the orb is 25 cm across. The retreat is less silk lined than that of *N. cornuta*. The web has been illustrated by Nielsen (1932, fig. 305). I think the species prefers more arid, shaded areas than *N. cornuta*. I have found the retreat under bark in lodgepole pine at Jackson Hole, Wyoming, in a rather dry area. According to Wiehle (1931) and Kaston (1948) there may be a signal thread to the retreat or the spider may use a radius to return to it.

*Distribution.* Some American authors indicate that this is a more northern species than *N. cornuta*. This may not be quite correct; however, the species is not found in the southeastern states. It appears to be common from the Arctic to North Carolina and Arizona but is much commoner than *N. cornuta* in the west, the Rocky Mountains, and the Pacific northwest states (Map 3); also Eurasia.

*Nuctenea sclopetaria* (Clerck),  
new combination  
Bridge spider, Gray-cross spider  
Figures 85–88, 103–104, 108, 114–115,  
124, 125, 128; Map 4

*Araneus sericatus* Clerck, 1757, *Aranei Svecici*, p. 40, pl. 2, fig. 1, ♀. Female type from Sweden

lost. Bonnet, 1955, *Bibliographia Araneorum*, 2: 594.

*Araneus sclopetarius* Clerck, 1757, *Aranei Svecici*, p. 43, pl. 2, fig. 3, ♂. Type specimen from Sweden lost. Locket and Millidge, 1953, *British Spiders*, 2: 136, figs. 88b, 89a, 90a, ♀, ♂.

*Aranea undata* Olivier, 1789, *Encycl. Méthod. Hist. Nat. Ins. Paris*, 4: 206. New name for *sclopetarius* Clerck, but preoccupied by DeGeer, 1778. Wiehle, 1931, in Dahl, *Tierwelt Deutschlands*, 23: 90, figs. 130–133.

*Aranea ovigera* Panzer, 1804, *Syst. Nomencl.*, in Schäffer, *Icon. Ins. Ratish.*, 1: 244, pl. 174, fig. 3.

*Aranea sericata*, - Comstock, 1912, *Spider Book*, p. 486, figs. 510–512, ♀, ♂; 1940, *op. cit.*, rev. ed., p. 500, figs. 510–512, ♀, ♂.

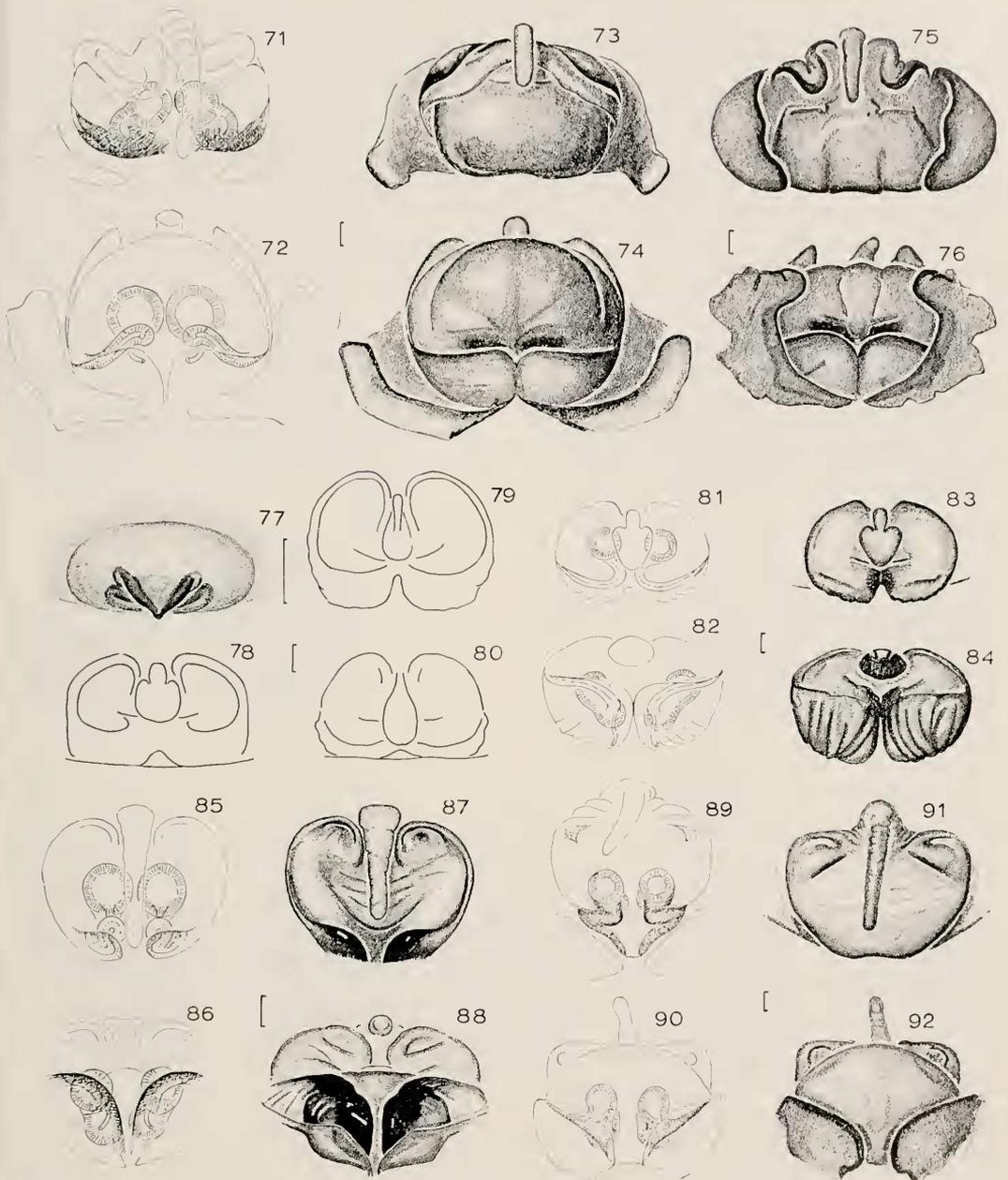
*Aranea ovigera*, - Roewer, 1942, *Katalog der Araneae*, 1: 801.

*Epeira undata*, - Kaston, 1948, *Bull. Connecticut Geol. Natur. Hist. Surv.*, 70: 256, figs. 789, 805, 814–815, 2044–2046, ♀, ♂, web, egg sac.

*Cyphopeira sclopetaria*, - Yaginuma and Archer, 1959, *Acta Arachnol.*, 16: 41.

*Cyphopeira sericata*, - Prószyński and Staręga, 1971, *Katalog Fauny Polski*, 16: 84.

*Note.* According to Bonnet (1955), O. P.-Cambridge (1874, *Trans. Linnean Soc.*, 30: 330) first synonymized the two simultaneously, published names *sericatus* and *sclopetarius*, and chose *sclopetarius*. However, this seems to be an error; the names were first synonymized by Westring (1851,



Figures 71-76. *Nuctenea cornuta* (Clerck), epigynum. 71, 73, 75. Ventral view. 72, 74, 76. Posterior view. 71-72. Cleared. 71-74. (Panama Canal Zone.) 75, 76. (Alberta.)

Figures 77-84. *N. patagiata* (Clerck), epigynum. 77-81, 83. Ventral. 82, 84. Posterior. 81, 82. Cleared. 77. Probably epigynum before last molt. (South Dakota.) 78, 79. (Alberta.) 80. (British Columbia.) 81-84. (Ontario.)

Figures 85-88. *N. sclopetaria* (Clerck), epigynum. 85, 87. Ventral. 86, 88. Posterior. 85, 86. Cleared.

Figures 89-92. *N. ixobola* (Thorell), epigynum. 89, 91. Ventral. 90, 92. Posterior. 89, 90. Cleared.

Scale lines. 0.1 mm.

Göteborg Kongl. Vet. Handl., 2: 34), who also chose *sclopetaria*. Thorell (1856, N. Acta Reg. Soc. Sci. Uppsala, p. 22) also lists the synonymy under *sclopetaria*. Bonnet shows that prior to 1938 the usage of *sclopetaria* outweighed *sericata*, although *sericata* has been uniformly used in North America and also by Bonnet (1955). I will follow European arachnologists and use *sclopetaria* as do Locket and Millidge (1953, British Spiders, 2). (See Article 24a of the International Code on Zoological Nomenclature, 1961.)

*Variation.* Total length of females 8–14 mm. Carapace 3.9–4.3 mm long, 3.1–4.0 mm wide. First patella and tibia 5.3–7.0 mm. Total length of males 6–7 mm. Carapace 3.7–3.2 mm long, 2.9–3.3 mm wide. First patella and tibia 6.2–7.0 mm.

*Diagnosis.* This species can usually be separated from *N. cornuta* and *N. patagiata* by the white hairs around the border of the carapace and by the fact that the background of the eye region is lighter brown than the area behind it and than the area of the clypeus (Fig. 108). The female's epigynum has the scape finger-shaped, as in *N. cornuta* but not as in *N. patagiata*, and the anterolateral margins of the base lobed and flat (Fig. 87), not as in *N. cornuta*. The openings of the epigynum are in dark posterior swellings of the base (Fig. 85). The palpus has a lobe-shaped terminal apophysis (Figs. 114, 115), somewhat like that of *N. patagiata*. The median apophysis is not as deeply divided as that of *N. patagiata* (Figs. 115, 128). The embolus resembles that of *N. patagiata* (Figs. 124, 125).

*Natural history.* This is the least common of the three *Nuctenea* species in North America and is found on houses and other buildings, often near water. One collection from West Virginia came from sweeping honeysuckle bushes (*Lonicera* sp.). Many webs may be found touching one another (Kaston, 1948). In Europe the species is also found on buildings, and especially on bridges and cliffs above

water (Wiehle, 1931). The orbs have up to 20 radii, with the viscid spiral separated, and the web reaches 70 cm in diameter (Wiehle, 1931). The web is illustrated in Kaston (1948, figs. 2044, 2046). The spider rests near the end of one of the frame threads rather than in a retreat. The egg sac, according to Kaston, contains 114–337 eggs, and is illustrated in his figure 2045.

*Distribution.* Eurasia. In America this species is probably introduced, judging by its close association with buildings and its limited distribution, which matches that of *Araneus diadematus* Clerck. It is found from Newfoundland to southern Alaska, south to North Carolina, and is most abundant in the Great Lakes states (Map 4).

*Nuctenea ixobola* (Thorell)  
new combination

Figures 89–92, 95, 109, 116–117, 129

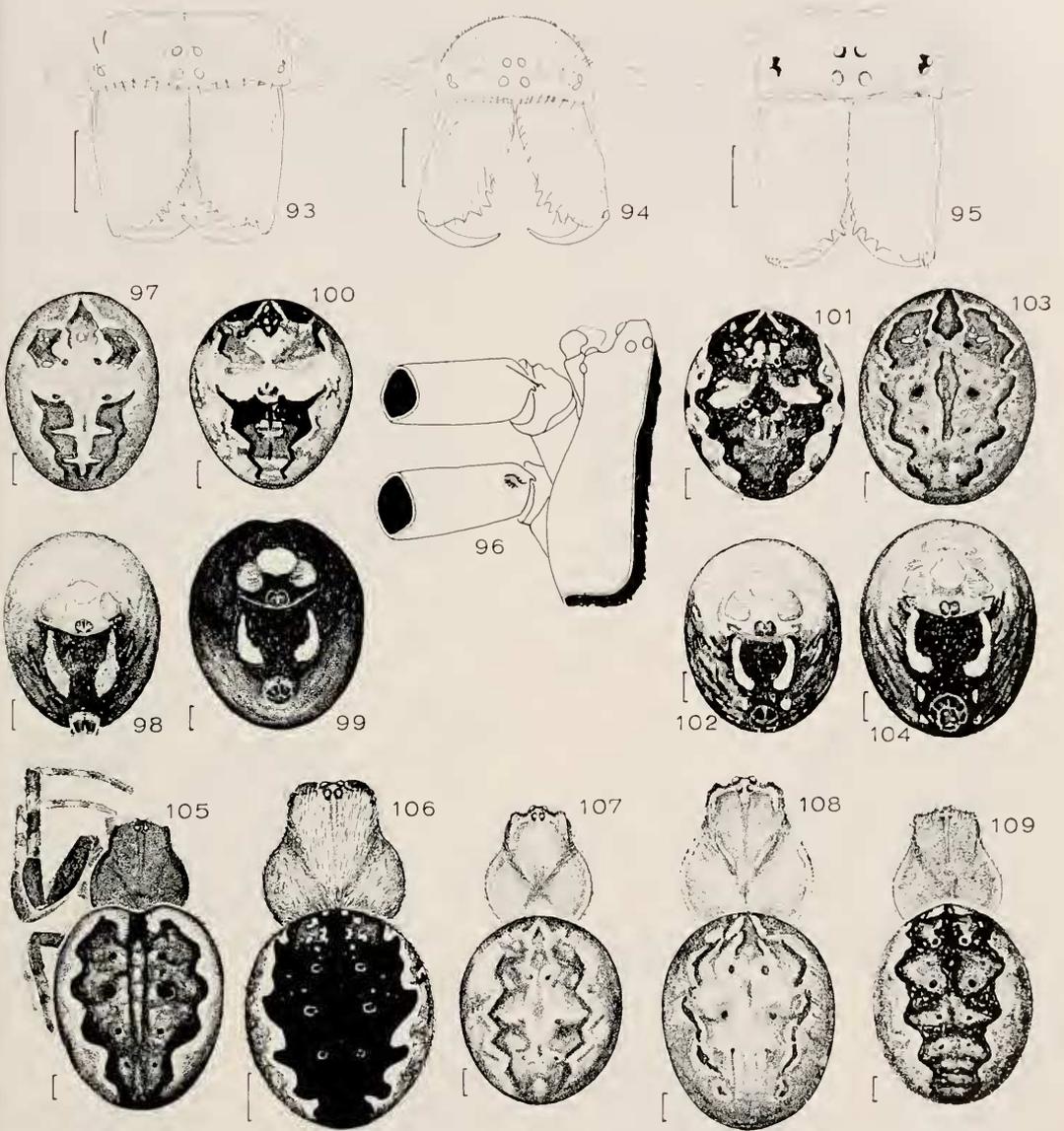
*Epeira ixobola* Thorell, 1873, Remarks on Synonyms of European Spiders, p. 545. Two male and three female syntypes from Austria in the Natural History Museum in Stockholm, not examined.

*Aranea ixobola*, - Wiehle, 1931, in Dahl, Tierwelt Deutschlands, 23: 92, figs. 134–137, ♀, ♂. Roewer, 1942, Katalog der Araneae, 1: 788.

*Araneus ixobolus*, - Bonnet, 1955, Bibliographia Araneorum, 2: 523.

*Description.* Female from Poland. Carapace very flat, no thoracic depression. Secondary eyes all about 0.7 diameter of anterior median eyes. Anterior median eyes slightly more than their diameter apart, posterior median eyes their diameter apart. Lateral eyes on tubercles and widely separated from the median eyes. The height of the clypeus equals 0.6 diameters of the anterior median eyes. Total length 13 mm. Carapace 6.5 mm long, 5.3 mm wide. First femur, 6.3 mm; patella and tibia, 8.6 mm; metatarsus, 5.7 mm; tarsus, 2.0 mm. Second patella and tibia, 8.0 mm; third, 4.4 mm; fourth, 6.3 mm.

Male from Poland. Carapace and eye arrangement as in female. Total length 12 mm. Carapace 5.4 mm long, 4.7 mm



Figures 93-95. Eye region and chelicerae. 93. *Nuctenea umbratica*. 94. *N. cornuta*. 95. *N. ixobola*.

Figure 96. Left anterior femora and carapace of *N. patagiata*.

Figures 97-104. Abdomen. 97-98. *N. cornuta*. 99. *N. umbratica*. 100-102. *N. patagiata*. 103-104. *N. sclopetaria*. 97, 100, 101, 103. Dorsal. 98, 99, 102, 104. Ventral.

Figures 105-109. Carapace and abdomen, dorsal. 105. *N. umbratica*. 106. *N. silvicultrix*. 107. *N. patagiata*. 108. *N. sclopetaria*. 109. *N. ixobola*.

Scale lines. 1.0 mm.

wide. First femur, 8.3 mm; patella and tibia, 11.8 mm; metatarsus, 8.2 mm; tarsus, 3.3 mm. Second patella and tibia, 10.0 mm; third, 5.0 mm; fourth, 7.4 mm.

*Diagnosis.* Females have a narrow scape in the epigynum as does *Nuctenea sclopetaria*, with which it has been confused. However, the anterior lateral end of the base differs (Figs. 89, 91) and posterior lobes of the base do not extend ventrally. The male differs from that of *N. sclopetaria* in having a differently shaped embolus (Fig. 116).

*Natural history.* According to Wichle (1931), this species is similar in habits to *N. sclopetaria* and replaces it in eastern Europe. It lives on buildings, fences, and bridges near water.

*Distribution.* From Central Europe to Iran (Roever, 1942; Bonnet, 1955). Specimens examined came from Leopoldshall (Anhalt, German Democratic Republic), Biolowieza, Distr. Hajnowka, and Distr. Kosice, Poland.

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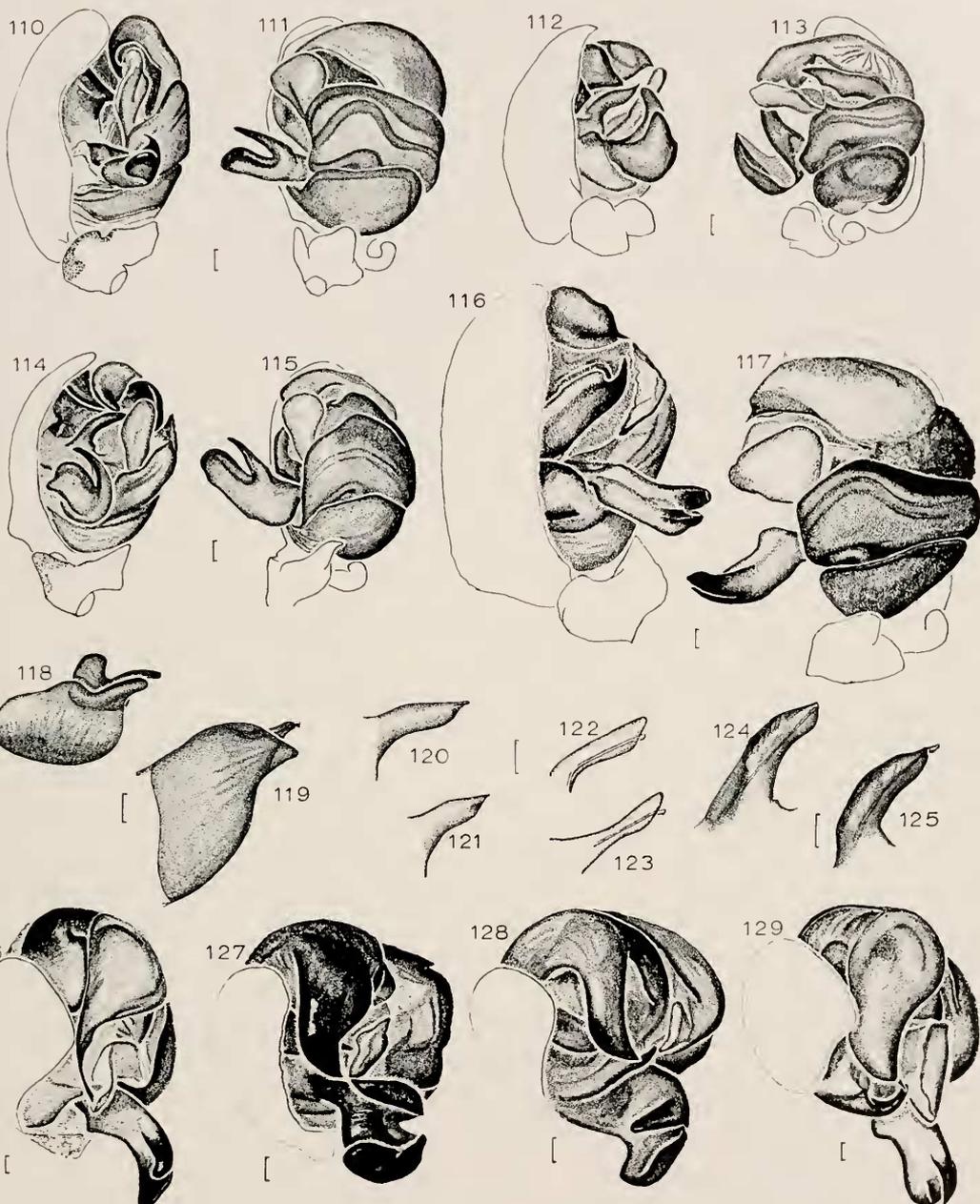
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Scale lines. 0.1 mm.

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